(1) In order to calculate a confidence interval, I must first meet the Independence Assumption and the Sample Size Assumption. In order to meet the Independence Assumption, I must first satisfy the Random Sample Condition and the 10% Condition.

Random Sample Condition

The votes were sampled randomly, as stated in the problem

10% Condition

We can assume that 330 votes are less than 10% of the population

To meet the Sample Size Assumption, I must first satisfy the Success/Failure Condition.

Success/Failure Condition

$n\hat{p} \geq 10$ and $n\hat{q} \geq 10$

$144 \geq 10$ $186 \geq 10$

← given in problem

Both the number of success/failures are at least 10.

Since I have satisfied the required Assumptions/Conditions, I can use a **one-proportion z-interval** to create a 95% confidence interval for the

$n = 330$, $\hat{p} = \frac{144}{330} \approx .436$ $SE(\hat{p}) = \sqrt{\frac{\hat{p}\hat{q}}{n}} = \sqrt{\frac{.436(.564)}{330}}$

$= .027$

The margin of error is $= z^* \cdot SE(\hat{p}) = 1.96(.027) = .05292$

$\approx .053$

The 95% Confidence Interval: $\hat{p} \pm ME$

$.436 \pm .053 \Rightarrow (.383 \text{ and } .489)$

We are 95% confident that the true proportion of voters who will vote for a new teenage curfew is between .383 and .489.

(2) a) 95% Confidence Interval:

$= \hat{p} \pm ME$

$= .73 \pm .028$

$= (.702, .758)$

No need to check assumptions/conditions
- already told what ME is

b) $SE(\hat{p}) = \sqrt{\frac{\hat{p}\hat{q}}{n}} = \sqrt{\frac{.73(.27)}{1016}} = .014 = 1.4\%$

c) It would decrease → new margin of error

$ME = z^* \sqrt{\frac{\hat{p}\hat{q}}{n}} = 1.96 \sqrt{\frac{.73(.27)}{2000}} = .019 \approx 1.9\%$,

which is small then 2.8%

③

a) In order to calculate a confidence interval, I must first meet the Independence Assumption and the Sample Size Assumption. In order to meet the Independence Assumption, I must first satisfy the Random Sample Condition and the 10% Condition.

Could probably just satisfy the Independence Assumption

Random Sample Condition

It is reasonable to assume that that the subjects were randomly placed into control + treatment groups

10% Condition

Doesn't really apply since we are talking about medication, not subjects

To meet the Sample Size Assumption, I must first satisfy the Success/Failure Condition.

Success/Failure Condition

$n\hat{p} \geq 10$ and $n\hat{q} \geq 10$

$53(.27) \geq 10$ and $53(.73) \geq 10$

$14 \geq 10$ $\quad$ $39 \geq 10$

Both the number of successes and failures are greater than or equal to 10

Since I have satisfied the required Assumptions/Conditions, I can use a **one-proportion z-interval** to create a p confidence interval for the

$n = 53, \ \hat{p} = .27 \quad SE(\hat{p}) = \sqrt{\frac{.27(.73)}{53}} = .061$

$95\% \ CI = \hat{p} \pm ME$

$= .27 \pm (1.96 \cdot .061)$

$= .27 \pm .120$

$= (.15, .39)$

We are 95% confident that the true proportion of students who will report improvement after using a new medication is between .15 and .39.

b) 90% CI =

$\hat{p} \pm ME$

$.27 \pm 1.645(.061)$

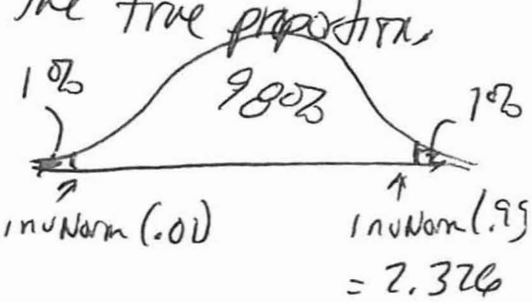
$.27 \pm .10$

$(.17, .37)$

We are 90% confident the true proportion of subjects who will report improvement after using a new medication is between .17 and .37.

We have increased our precision, but at the expense of less confidence in our ability to capture the true proportion.

c) 98% CI has a $z^* = 2.326$



$.05 = 2.326\sqrt{\frac{(.27)(.73)}{n}}$

$n = 426.5 \rightarrow$ we need a sample size of 427 to have a margin of error of ±5% with 98% confidence.

(4) $ME = z^*\sqrt{\frac{\hat{p}\hat{q}}{n}}$

$.03 = 1.96\sqrt{\frac{.5(.5)}{n}}$

$n = 1068$

We use $\hat{p} = .5$ because this is the most cautious proportion. It maximizes the numerator.

A sample size of 1068 will produce a margin of error ±3% with a 95% confidence interval

5. a) $ME = z^* SE(\hat{p})$

$ME = z^* \sqrt{\frac{\hat{p}\hat{q}}{n}}$

$.05 = 1.645 \sqrt{\frac{.46(.54)}{n}}$

$n = 269$

A sample size of 269 records will yield a margin of error of ±5% with 90% confidence.

b. In order to calculate a confidence interval, I must first meet the Independence Assumption and the Sample Size Assumption. In order to meet the Independence Assumption, I must first satisfy the Random Sample Condition and the 10% Condition.

Random Sample Condition

We can assume that the records are picked randomly

10% Condition

The 525 records are less than 10% of the population, which is 10,000

To meet the Sample Size Assumption, I must first satisfy the Success/Failure Condition.

Success/Failure Condition

$n\hat{p} \geq 10$ and $n\hat{q} \geq 10$

$229 \geq 10$ and $296 \geq 10$

↑ given

Both the number of successes and failures are at least 10.

Since I have satisfied the required Assumptions/Conditions, I can use a **one-proportion z-interval** to create a $\hat{p}$ confidence interval for the

$n = 525 \quad \hat{p} = \frac{229}{525} \approx .436 \quad SE(\hat{p}) = \sqrt{\frac{\hat{p}\hat{q}}{n}} = \sqrt{\frac{.436(.564)}{525}}$

$= .022$

$$90\% \text{ Confidence Interval} = \hat{p} \pm z^* SE(\hat{p})$$
$$= .436 \pm 1.645(.022)$$
$$= .436 \pm .03619$$
$$= (.40, .47)$$

c. We are 90% confident that the true proportion of females in US Labor force is between .40 and .47.

d. If many random samples were taken, 90% of the 90% confidence intervals would contain the true proportion of females in the US Labor force.

e. The 90% Confidence Interval is from .40 to .47. So, since .46 falls within the 90% confidence interval, it is possible that the true proportion of females in the US Labor Force could be .46. There is no reason to think that the US rate is lower than Europe's rate of .46.